



# **Armed Forces College of Medicine AFCM**







# Diseases of kidney

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# **Lecture (4)**

## **Renal calculi & renal tumours**



# INTENDED LEARNING OBJECTIVES (ILOs)



**By the end of this lecture the student will be able to:**

1. Mention the sites , etiology and types of renal calculi.
2. Predict the complications of renal calculi.
3. Mention the origin of renal cell carcinoma and its methods of spread.
4. Correlate the clinical picture with the histopathological features and other laboratory investigations in renal cell carcinoma.
5. State the origin of Wilms' tumour and its methods of spread.
6. Correlate the clinical picture with the histopathological features and other lab investigations in cases of Wilms' tumour



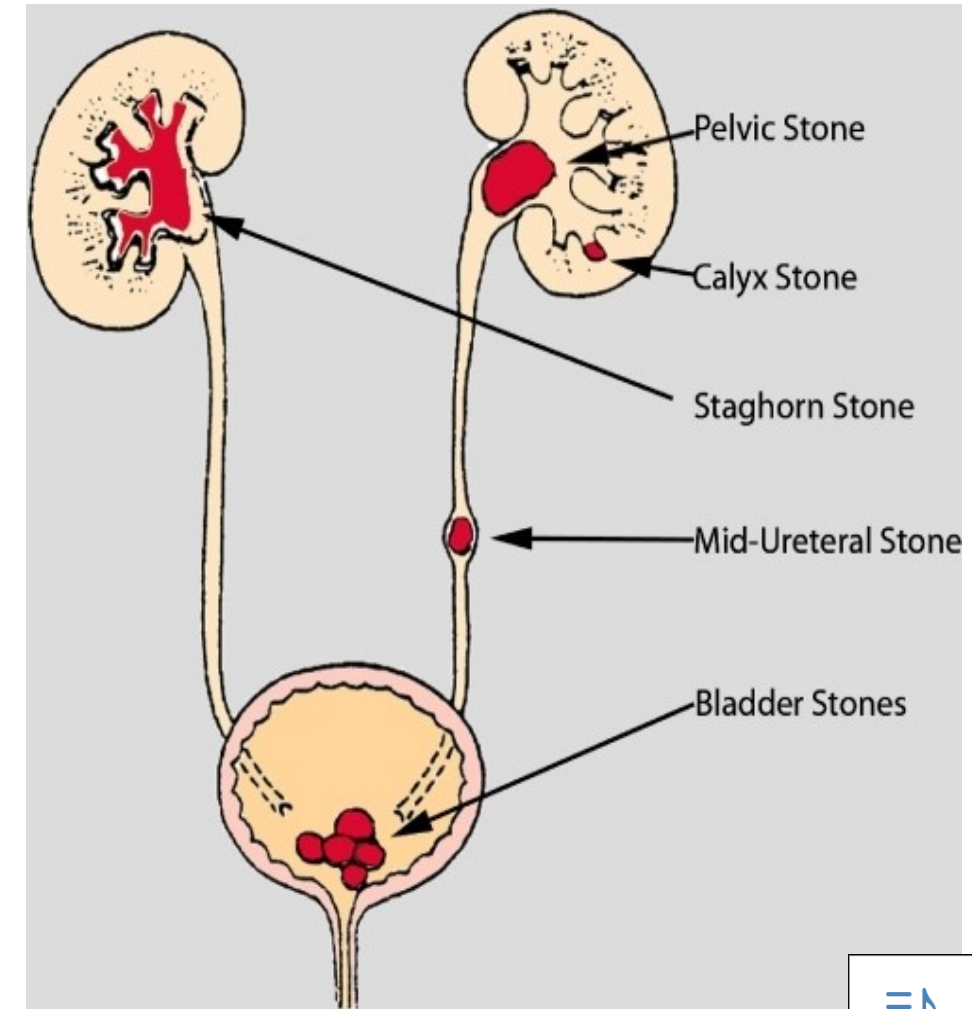
# Renal calculi (stones or urolithiasis)



## Renal calculi

Due to precipitation of urinary crystalloids in

- ☐ Renal pelvis
  - ☐ Urinary bladder
- or



# Renal calculi (stones or urolithiasis )



## Aetiology

**1-Disturbances of  
Urine composition**

**2-Stasis of urine**

**3-Urinary infection**



# Renal calculi (stones or urolithiasis )



## Aetiology

### 1-Disturbances of urine composition

**A. Decreased water** content (concentrated urine)  
e.g. due to excessive sweating

**B. Increased crystalloids**

- ☐ Excess **calcium** as in hyperparathyroidism
- ☐ Excess **uric acid and urates** in cases of gout
- ☐ Excess **oxalates**:
  - 1) Hereditary metabolic error
  - 2) Excess intake in diet (mango, tomato)
- ☐ Familial **cystinuria**



# Renal calculi (stones or urolithiasis)



## 2-Stasis of urine due to urinary obstruction

- ❑ Allows easier precipitation of crystalloids of urine
- ❑ Predisposes to infection

## 3-Urinary infection

### A. It predisposes to precipitation of urinary crystalloids

through formation of a nucleus (nidus) as pus cells, detached necrotic cells.

### B. Change of pH of urine

- ❑ **Alkaline** urine (in case of urea splitting bacteria)  
→ favors precipitation of **Phosphate , ammonium & magnesium**

- ❑ Increased **acidity** (in case of E. coli)



# Renal calculi (stones or urolithiasis )



## Types of stones

**A) Primary (metabolic) stones**

**B) Secondary (infected) stones**

Urinary infection is **NOT** essential for their formation



**Calcium oxalate stones**  
**Uric acid stones**  
**Cystine stones**



**Magnesium ammonium phosphate stones**  
**(Struvite)**





# Renal calculi (stones or urolithiasis )



## A) Primary (metabolic) stones

### Calcium oxalate stones

60%



<https://eunatural.com/kidney-stones-and-oxalates/>

- It forms in **acidic** urine
- Occurs in **renal pelvis**
- Multiple hard with spiny surface
- Dark stones due to injury of urinary mucosa & hemorrhage.

### Uric acid stones

8%



<https://www.stonedisease.org/uric-acidapatite-kidney-stones>

- It forms in **acidic** urine
- Occurs in **renal pelvis**
- Single hard with smooth surface
- Yellowish brown

### Cystine stones

2%



<https://www.preventcystinestones.com>

- It forms in **acidic** urine
- Occurs in **renal pelvis**
- Soft
- Yellowish green

**N.B Calcium phosphate stone in alkaline medium**



# Renal calculi (stones or urolithiasis)

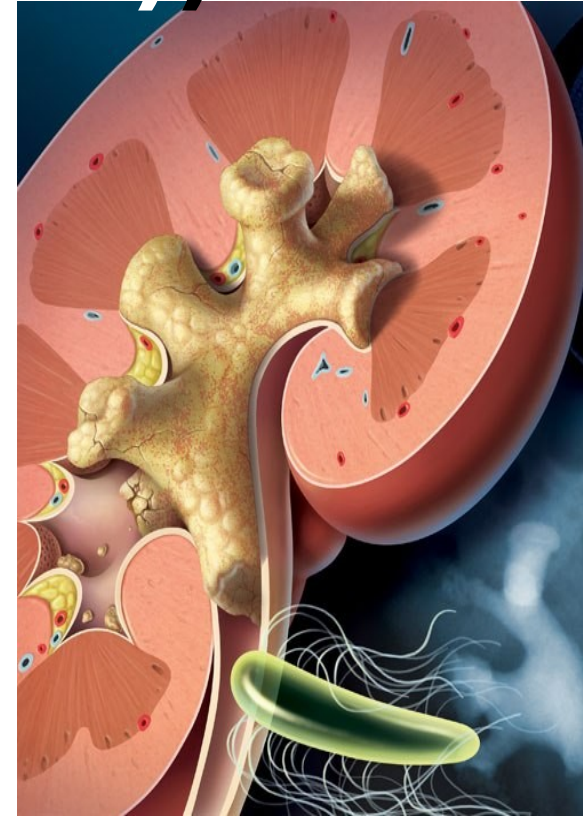


**Staghorn**

## **B) Secondary (infected) stones**

**Magnesium ammonium phosphate stones (Struvite stone) (30%)**

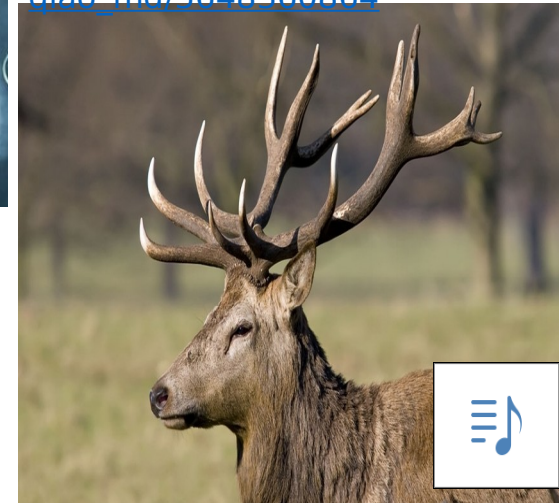
- Develops in **alkaline** urine
- Solitary ,large ,white ,friable, of smooth surface
- **Commonly forms in urinary bladder**
- **May form in renal pelvis & calyces** casting their shape (**Staghorn**



<http://www.toddbuck.com/kidney-stones-5>



[https://www.flickr.com/photos/jian-hua\\_giao\\_md/5648360864](https://www.flickr.com/photos/jian-hua_giao_md/5648360864)



stone)

# Renal calculi (stones or urolithiasis )



## Effects and complications

### 1- Migration from renal pelvis to ureter or bladder

- ☐ Renal colic
- ☐ Urinary obstruction

### 2-Urinary obstruction

- ☐ Complete & bilateral → Calculus anuria
- ☐ Incomplete → Hydroureter & hydronephrosis



<https://colicorenal.top/>

**3-Urinary Infection:** due to urinary obstruction and urine stasis

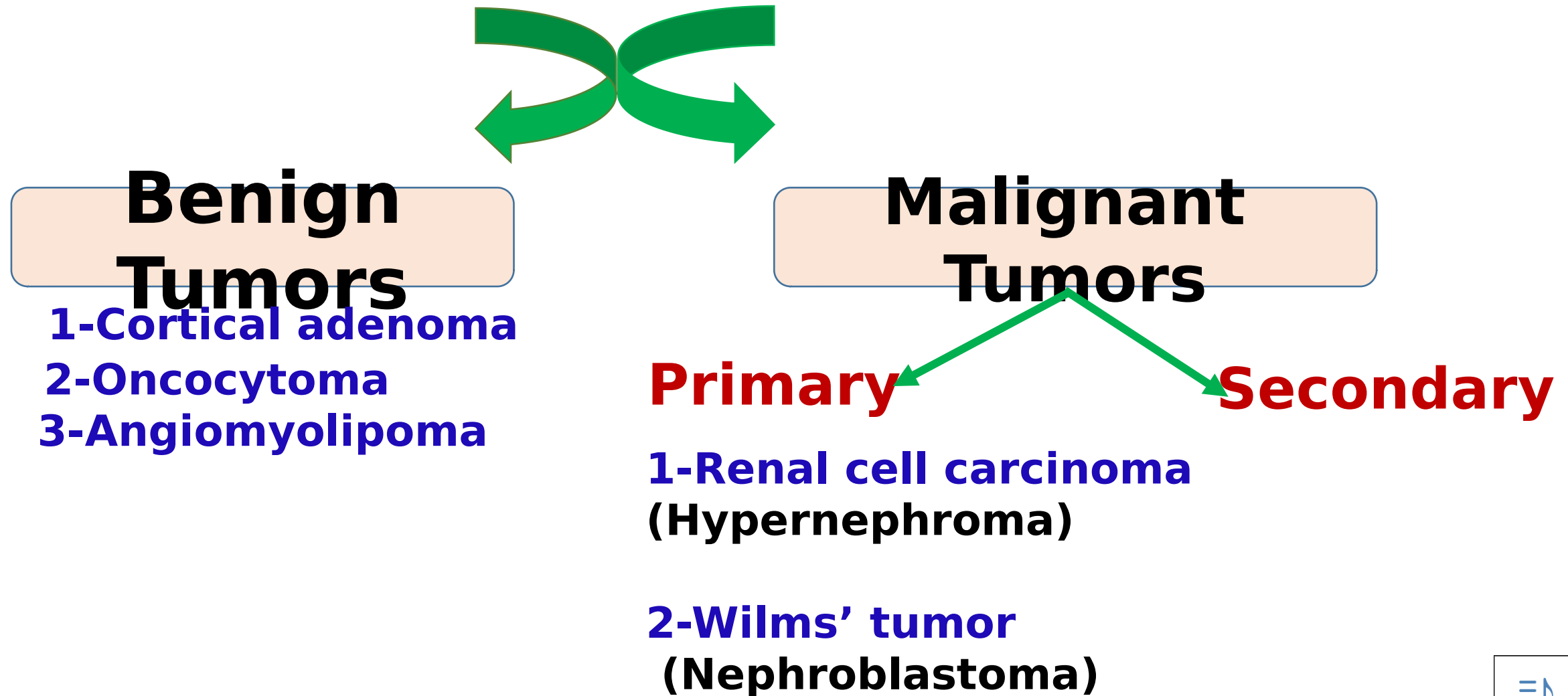
**4-Hematuria:** due to trauma to the urinary mucosa particularly by oxalate stone

**5-Squamous metaplasia**

**6 Squamous cell carcinoma** on top of squamous metaplasia



# Tumors of kidney

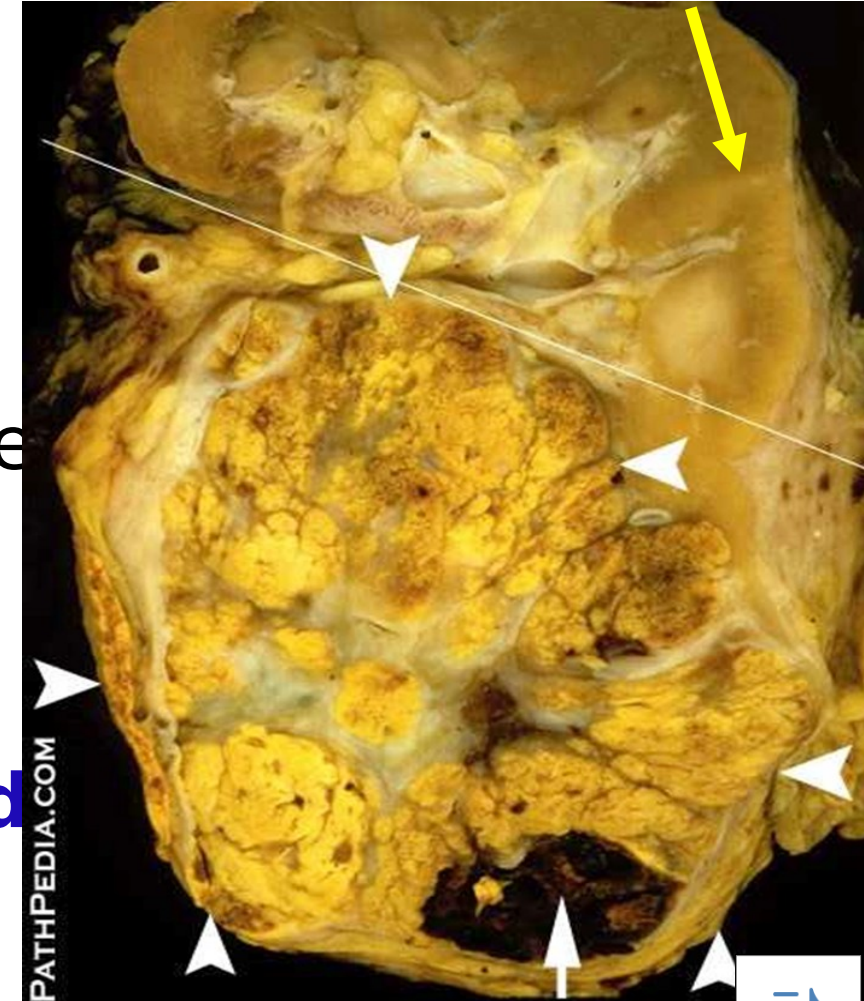




# Renal cell carcinoma (hypernephroma)



## Compressed renal tissue



<https://www.pathpedia.com/education/atlathology/kidney/Images.aspx?6>

14

**Origin:** Epithelial cells lining the renal tubules

**Age:** Peak incidence 6<sup>th</sup> decade of life

**Sex:** Male > female (2:1)

**Risk Factors:** smoking, chronic analgesic use, asbestos exposure, chronic renal failure

## **Gross**

- ☐ Arises at one pole of the kidney
- ☐ Well defined margins
- ☐ **Golden yellow** cut surface **(due to lipid & glycogen)**
- ☐ Areas of hemorrhage and necrosis
- ☐ Rest of kidney is compressed and appears

# Renal cell carcinoma (hypernephroma)



## Microscopic variants

**1-Clear cell carcinoma**

 **Most common type**

**2-Papillary renal cell carcinoma**

**3-Chromophobe renal cell carcinoma**





# **MIC Renal cell carcinoma, clear cell type**

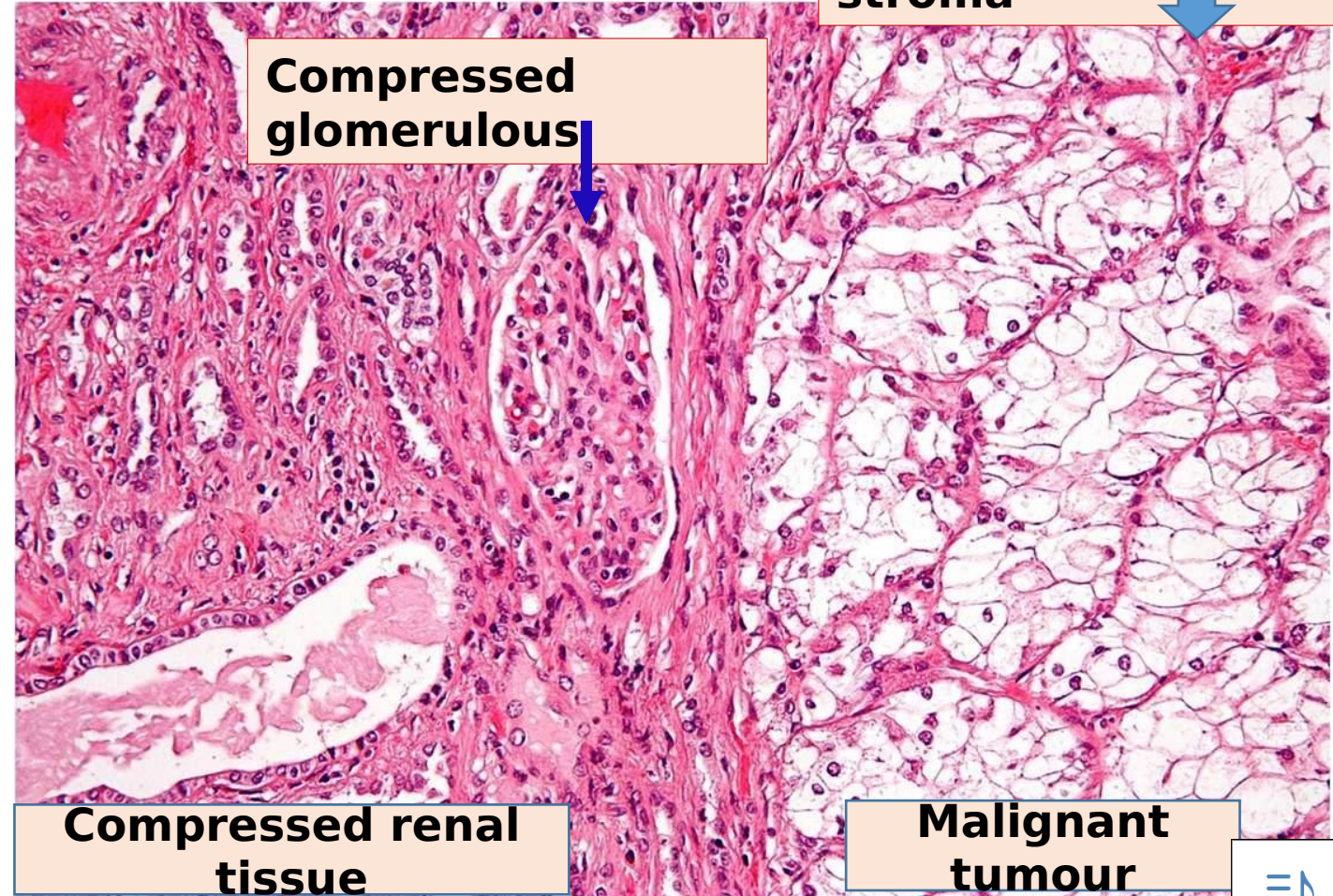


1- Malignant cells are arranged in solid masses, separated by delicate vascular connective tissue stroma.

2-The malignant cells have

- ❑ **Pale vacuolated cytoplasm**  
**(due to high glycogen & lipids content)**
- ❑ **Small deeply stained nuclei.**

3- Adjacent renal tissue is compressed.



# Renal cell carcinoma



## Spread

### 1-Local infiltration of

kidney tissue with invasion of

- Renal pelvis & ureters
- **Frequently** to renal veins & sometimes extending to IVC
- **Later** to renal capsule & perinephric fat.

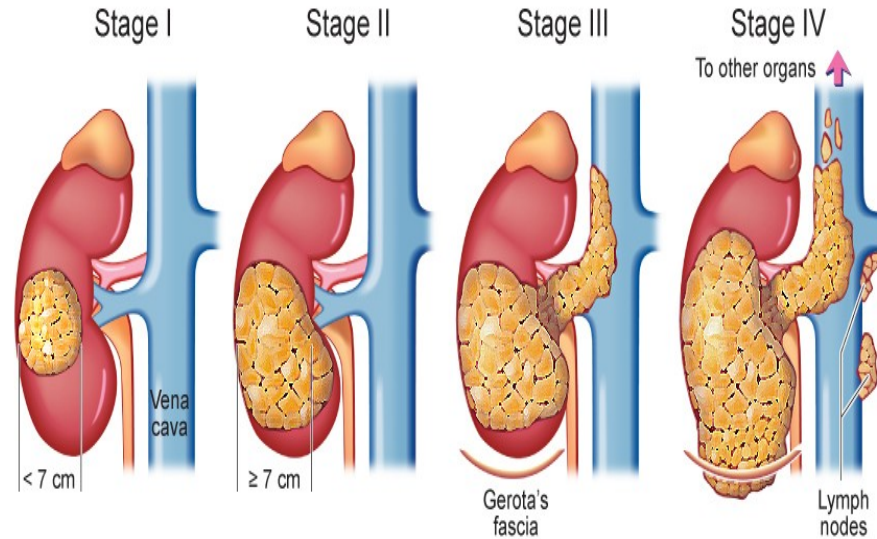
### 2-Blood:

Due to invasion of renal vein.

Most common sites

- Lung (**cannon ball secondaries**)
- bone, brain and adrenal gland

### 3-Lymphatic: Para-aortic



<http://popcultureworldnews.com/kidney-cancer/stages-of-kidney-cancer>



**(cannon ball secondaries)**





# Renal cell carcinoma

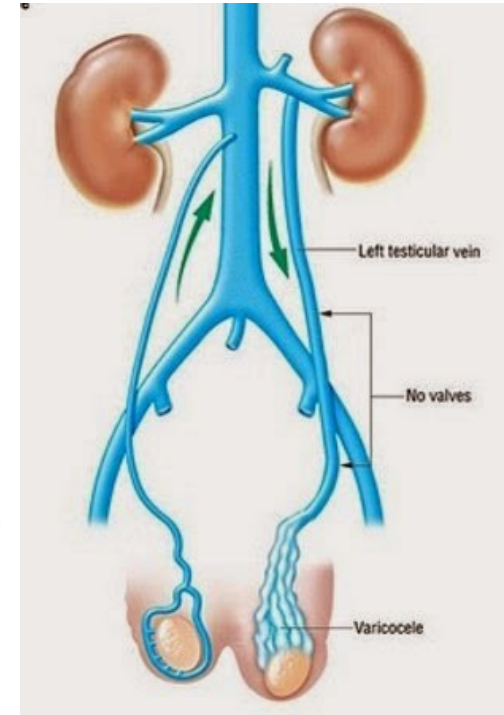
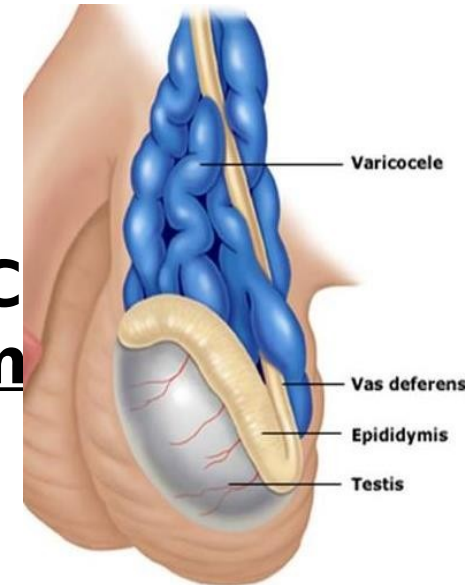


## Clinical features

1. Painless hematuria
2. Loin pain
3. Palpable loin mass
4. Varicocele of left testis in case of **left RCC**
5. May remain clinically occult , manifest by m
6. Paraneoplastic syndrome



### Varicocele



**Polycythemia**

**Cushing S**

**Erythropoietin**

stimulating substance  
( ectopic)

**Hypertension**

**Gynaecomastia**

**Renin**

**Hypercalcemia**

**Parathormone  
like hormone**

Due to  
secretion  
of



# Wilms' tumor (nephroblastoma)



## Origin

- ❑ **Malignant tumour** derived from:  
**mesodermal embryonic cell remnants**

## Age

- ❑ Most common embryonic tumor in infancy & childhood
- ❑ Most cases occur in children between **2 -5**

## Clinical picture

- ❑ Large palpable abdominal mass
- ❑ Abdominal pain
- ❑ Intestinal obstruction (occasionally)
- ❑ Hematuria
- ❑ Hypertension



<https://www.memorandapp.com/flashcards/33090/Hallmarks+of+Cancer+1/>

# Wilms' tumor (nephroblastoma)



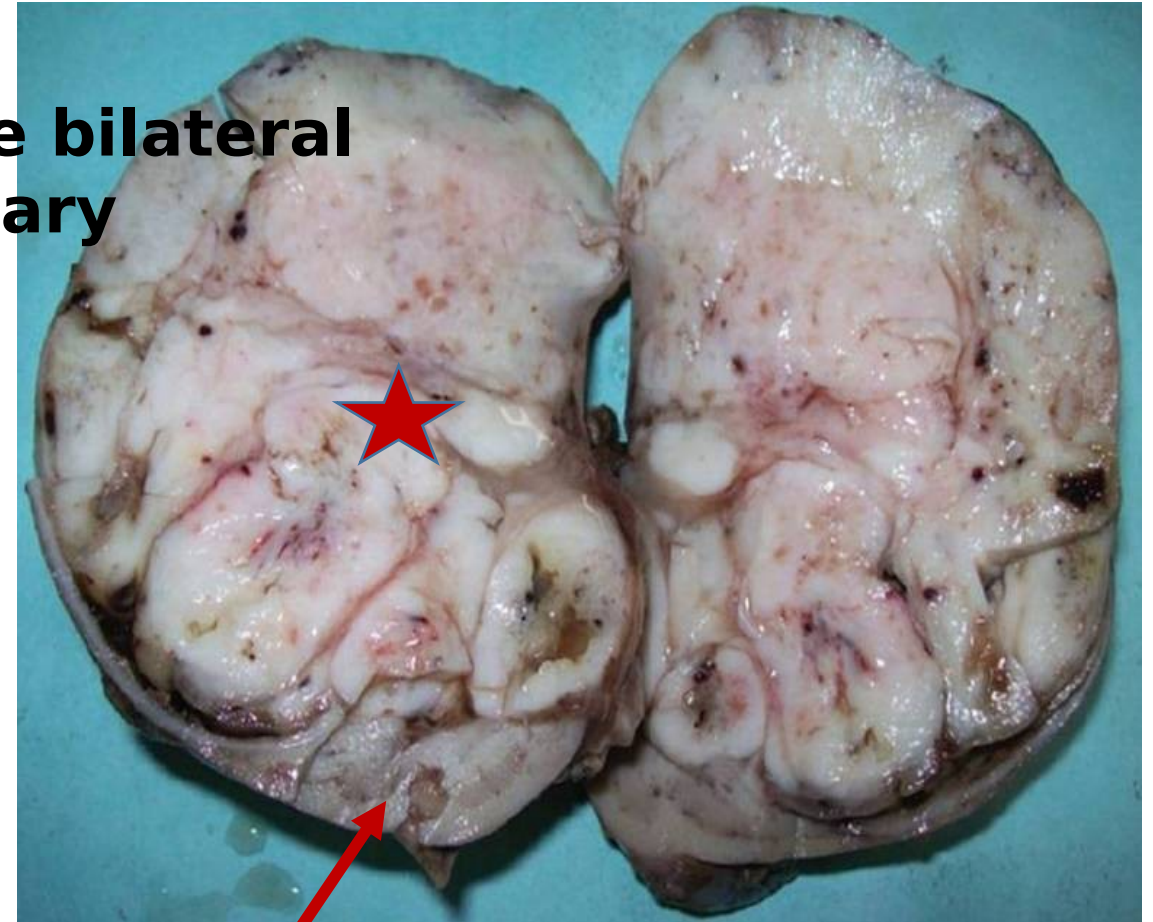
## N.B:

- ❑ 6% of cases of Wilms' tumor are bilateral
- ❑ One third of tumors are hereditary

## Gross

1. The kidney is enlarged.
2. Cut section showed replacement of renal parenchyma by a **large mass**

- Well demarcated but non capsulated
- Lobulated
- Whitish in colour
- Foci of hemorrhage & necrosis



**Compressed adjacent renal tissue**





# Wilms' tumor (nephroblastoma)



**ic:**

## Triphasic combination

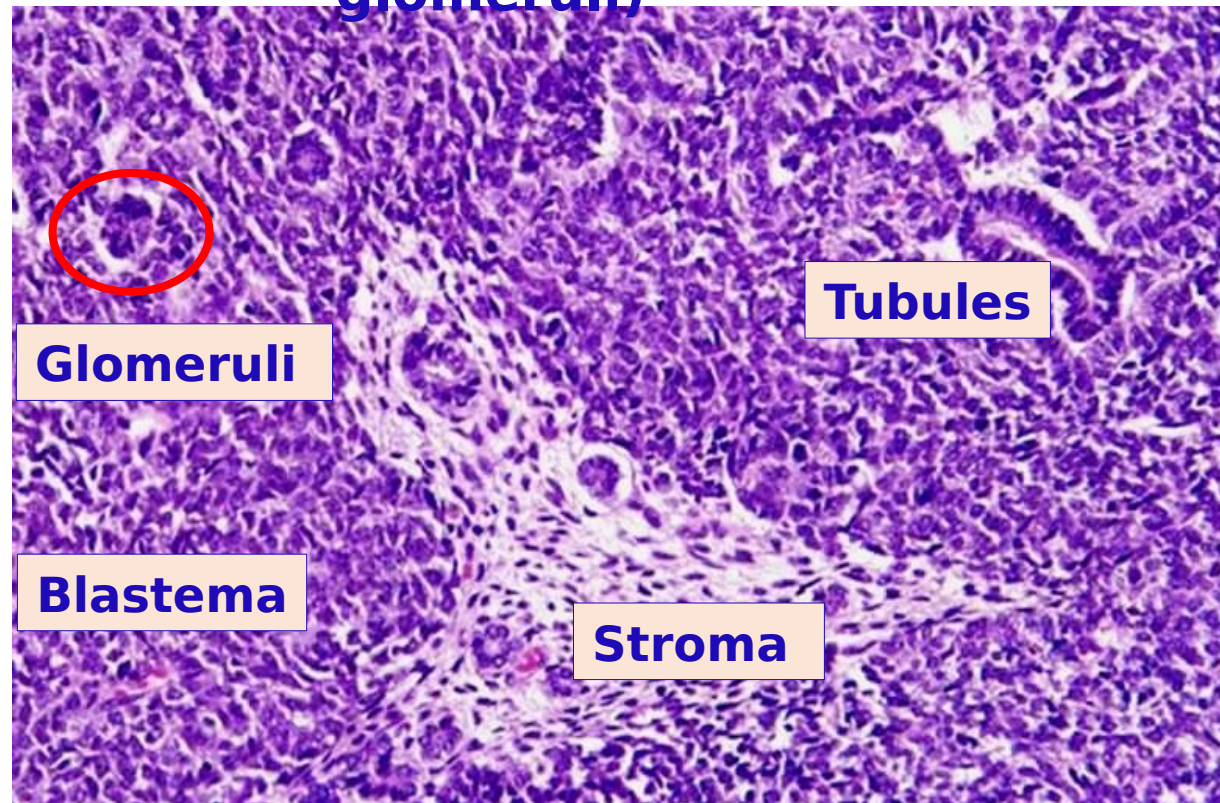
**1-Blastemal cells**

**2-Epithelial cells**  
(primitive = abortive tubules & glomeruli)

**3- Mesenchymal elements**  
(stroma)

❑ Sheets of **small primitive undifferentiated blue cells**

[https://www.pedsurglibrary.com/apsa/view/Pediatric-Surgery-NaT/829119/all/Wilms\\_Tumor](https://www.pedsurglibrary.com/apsa/view/Pediatric-Surgery-NaT/829119/all/Wilms_Tumor)



# Wilms' tumor (nephroblastoma)



## Spread:

**1-Local spread:** with destruction of kidney tissue

### Invasion of

- Renal capsule & perinephric fat
- Adrenal glands, bowel, liver or vertebrae
- Renal pelvis or ureter

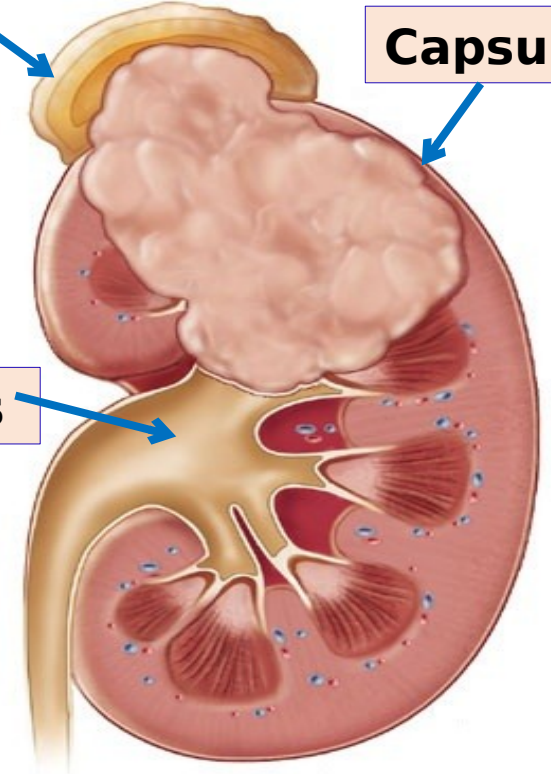
**2-Blood spread:** to Lung, Liver,

Bone, Brain

Suprarenal gland

Capsule

Pelvis



<https://kullabs.com/classes/subjects/units/lessons/notes/note-detail/5024>



# Quiz



**Which of the following renal tumours most likely causes left sided varicocele**

- A. Oncocytoma
- B. Renal cell carcinoma
- C. Angiomyolipoma
- D. Cortical adenoma

**Which of the following renal diseases most likely causes hematuria**

- A. Minimal change glomerulonephritis
- B. Renal calculi
- C. Membranous glomerulonephritis
- D. Cortical adenoma



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# Quiz



**The blastematos tissue in Wilm's tumour consists of which of the following?**

- A. Spindle shaped cells
- B. Small primitive cells
- C. Small muscle cells
- D. Malignant epithelial cells
- E. Neuroendocrine cells





# Quiz



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## SUGGESTED TEXTBOOKS



1. Robbins basic pathology 10<sup>th</sup> edition, 2018. Chapter 14: Kidney and its collecting system.
2. Kaplan step 1 pathology lecture notes. Chapter 15: Renal pathology ; 2017 (P.143-156)



# Thank you

